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JULY
1951

NUMBER 24

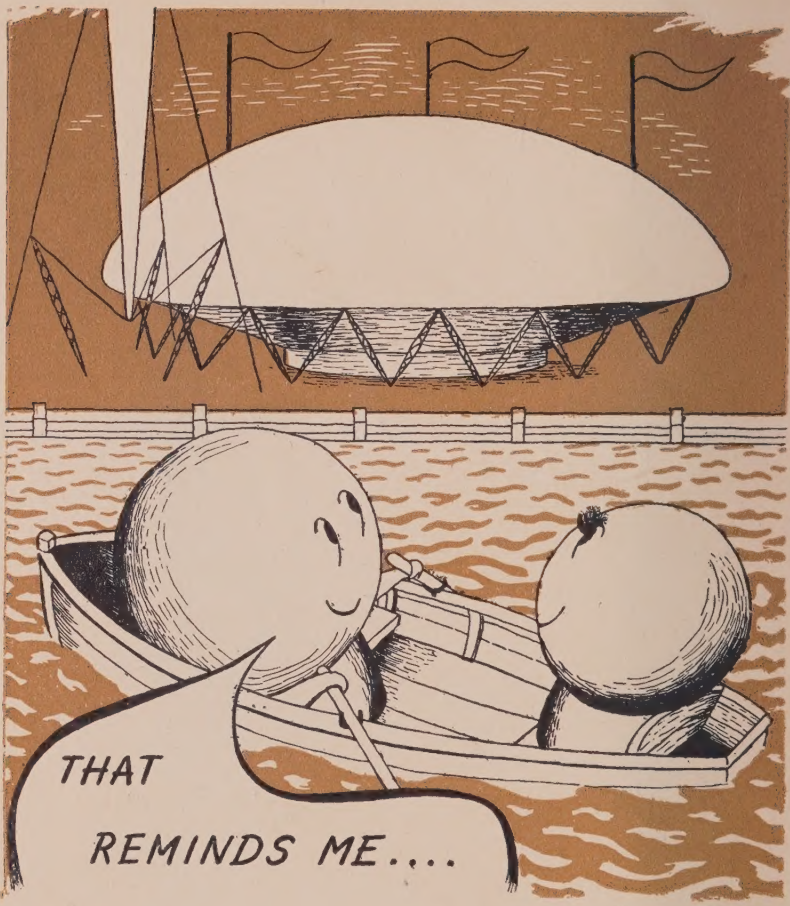
MGA

BULLETIN

ORGAN OF THE MUSHROOM GROWERS' ASSOCIATION

PRICE FIVE SHILLINGS

1 8 FEB 1973



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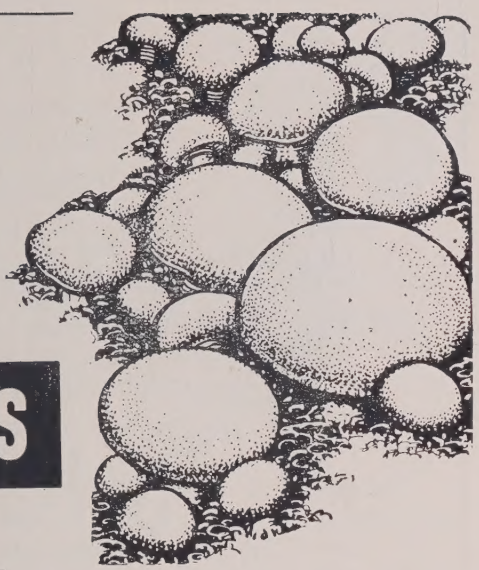

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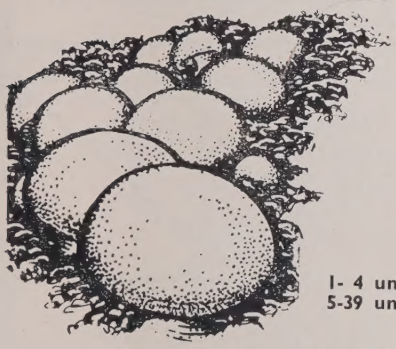

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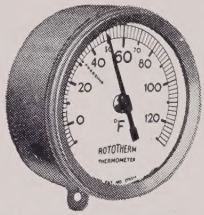

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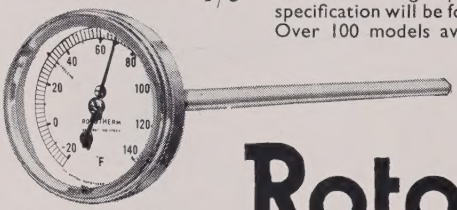

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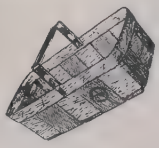

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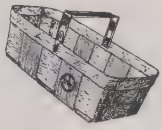

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MGA

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No responsibility can be accepted by the Editor, the Editorial Board, or the Mushroom Growers' Association, for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

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EDITORIAL

New Editor for New Series

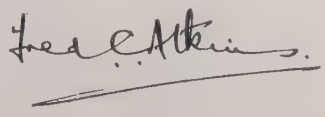
Fred. C. Atkins writes : M.G.A Bulletin Number One, published in October, 1945, was an ambitious affair of eight pages. It was so ambitious, indeed, that the Executive Committee entertained serious doubts as to whether its Editor, Stanley Middlebrook, would be able to find the material to fill eight pages every quarter . . . . . Five years later, under Angus Watson, the number of pages averages 72, and the work involved is hampering his primary duties as Secretary.

So this issue, Number 24, of July, 1951, appears in new clothes and marks yet another milestone in the development of our Journal. The advertisement section has been " farmed out " to Rooster Publicity, who are experts in this field and are conveniently situated in Peterborough, and I take over the Editorial Chair. Watson will be released to prosecute our new policy of Area Meetings and the organising of This and That on a bigger and better scale.

There was a paragraph in the Editorial of Bulletin One which read : " The M.G.A. is **your** show. The Bulletin, too, is very largely **your** show. The Editor invites comments and suggestions." As your new Editor I repeat that invitation and would particularly like more growers to come forward with notes on their farms and their practices for the series, " My Way of Growing."

I have met hundreds of growers since the M.G.A. was formed just six years ago, and I have been honoured by many friendships. I hope those friends will help me to maintain our Bulletin at its present high standard of usefulness and interest. It is certain that without sustained support from members in the shape of articles, letters, photographs and diagrams I cannot hope to make a success of my new task.

Happily, to assist me, is the Editorial Board : Stanley Middlebrook, Basil Harding and Angus Watson, now augmented by Dr. Ronald Edwards as Scientific Adviser.



RESEARCH OPE

About 300 growers defied all indications of wretched weather to attend the Mushroom Research Association's Annual Open Day and the Mushroom Growers' Association's Trade Show at Yaxley on Thursday, 3rd May. They were rewarded by warm sunshine until a cloudburst at three o'clock.

An unusual feature was the arrival—and even more exciting departure—of M.G.A. Vice-Chairman John Stewart-Wood in his Auster plane !

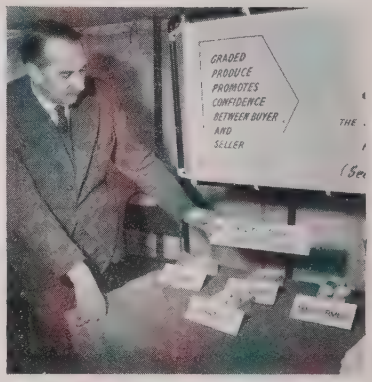
The Staff of the Research Station staged a number of exhibits clearly illustrating recent results and work in progress, and discussed growers' problems.

Dr. R. L. Edwards (Director of Research) and Mr. G. R. Brown (Foreman) showed compost made with moisture contents of 60-65% and 75-80% to compare the yields obtained. Composts made with wheat, barley and mixed straws were in the early stages of cropping.

In other experiments coarse, screened casing-soil (over $\frac{1}{4}''$) cropped earlier than the fine or mixed soil. Nearly 200 plastic pots were being used to study the relation between casing soil and water under various treatments.

A chart compiled from previous experiments showed the comparative costs, yields and cash return from various fertilisers used as sources of nitrogen. It emphasised the overwhelming importance of yield rather than cost. For example, dried blood might cost £25 more per 1,000 sq. ft. than nitro-chalk, but it produced mushrooms worth an extra £80.

Only urea and hoof-and-horn meal gave yields comparable with dried blood. They had been tested in only one experiment, and confirmation was needed before any alternative formula could be recommended.



M. E. SKILLMAN, N.A.A.S., *Provincial Glasshouse Advisor at the Ministry of Agriculture grading exhibits*

Another chart focussed attention on the potential importance

Mr. John Stewart-Wood, who will automatically succeed to the M.G.A. chairmanship in October, flew over to Yaxley from Aylesbury in 40 mins. in his Auster (by car it takes nearly 2 hrs. the Editor prefers this)

DAY AT YAXLEY

300 at Mushroom Trade Show

of casing time. In an experiment when beds were rather slow (10 weeks) to come into crop, those cased 21 days after spawning gave 1 lb., after 14 days $\frac{3}{4}$ lb., and after 7 days only $\frac{1}{2}$ lb./sq. ft. Beds which came into crop in 7 weeks gave the best yield if cased 14 days after spawning, compared with those cased 24 days after and 4 days after ; in this experiment the earliest casing again gave the lowest yield.

Clearly, quite large differences in yield might be caused by choice of the best time for casing, and it would be well worth while for each grower to find the best time under his own conditions.

The general indication was that, for maximum yield, a bed should not be cased until the spawn had run well through it. The increase in yield was mainly due to a greater number of mushrooms, which therefore tended to be smaller.

The trouble some growers were experiencing with small mushrooms on trays might be partly due to the production of a large number following a very vigorous spawn run. It would be worth trying, as an experiment, casing some trays rather earlier in such cases in an attempt to reduce the number of mushrooms and so increase their size, even at the expense of a slight fall in yield.

A third chart revealed that in two experiments there was no increase in yield from M.R.A. synthetic compost composted more than three weeks, although the yields from separate stacks became rather more consistent.

Mr. P. B. Flegg (Chemist) showed how the effect of lime in raising soil pH varied with the type of soil. 10 lb. of hydrated lime per ton raised the pH of a sample of sandy soil by 3 pH units, but a clay loam of the same original pH rose only 2 pH units.

Another difference between sandy and clay-loam soils was in moisture-holding capacity and rate of drying. When saturated, the clay-loam shown held twice as much water as the sand, had more to give up during the 12-day period illustrated, and still had over 10% moisture, whereas the sand was by then almost completely dry.

The ingenious apparatus used for measuring the moisture-holding capacity of soils and the suction pressure required to draw water from them was demonstrated.

Miss C. W. H. Duncan (Microbiologist) showed the method used in testing the effect of fungicides on the development of Truffle in compost.

Enlarged scale drawings showed the great differences in size between Phorid and Sciarid larvae, visible to the naked eye on careful inspection—Cecid larvae, often overlooked unless a magnifying glass was used—and eelworms, usually visible only with a microscope.

Particular interest was aroused by the specimens of Cecid larvae and eelworms. They appear to constitute a more widespread problem than has been realised hitherto. Other popular questions concerned casing soil and supplements to racing-stable manure.

Appreciated assistance was given to the demonstrators by Miss Warman, Miss Yarrow and Mrs. Reeves.

Incidentally, the Research Report for 1950 had just been published. It is available from the M.R.A. for 5/-. Contributors receive a free copy automatically.

The Trade Show was much bigger than the initial experiment last year, and it has been suggested that in future years it might be held in different parts of the country.

Interesting and helpful exhibits were staged by many good friends of the mushroom grower. They were : **Atlas Basket Co. Ltd.,** Atlas Works, Harpenden, Herts. ; **Harry F. Atkins (Machine Tools) Ltd.,** Old Fletton, Peterborough, Northants. ; **Bradford Fertilizer Co. Ltd.,** Whitefield Place, Girlington, Bradford, Yorks. ; **Burgess & Co.,** Bracknell, Berks. ; **D. C. Bushell & Co. Ltd.,** Sandhurst Corn & Grist Mills, Sandhurst, Camberley, Surrey ; **Derbyshire Stone Ltd.,** Cawdor Office, Matlock, Derbyshire ; **Thomas Elliott Ltd.,** Eagle Mills, 118-126 New Church Road, London, S.E. 5 ; **D. Griffiths,** Moulton, near Newmarket, Suffolk ; **Harvest Saver and Implement Co. Ltd.,** The Works, Kirbymoorside, Yorks. ; **E. J. Hibbins,** 24 Clare Road, Peterborough, Northants. ; **Geo. Monro, Ltd.,** Hertford Road,

One of the parties visiting Noble Mushrooms Ltd.

Waltham Cross, Herts.; **Mount Mushroom Spawn Laboratories,** Littlebourne, Canterbury, Kent; **Murphy Chemical Co. Ltd.,** Wheathampstead, nr. St. Albans, Herts.; **N.F.U. Mutual Insurance,** (Agent: Angus Watson); **" Old Estate House " Mushroom Farm,** Wollaton, Nottingham; **Pinkerton's Scottish Mushroom Laboratories,** Millerston, Glasgow, Scotland; **J. E. R. Simons Ltd.,** Natts Farm, Harlow, Essex; **W. Stevens,** Thornwood Common, near Epping, Essex; **R. G. Warwick,** Wickham, Hants.; **West Dock Timber Co. Ltd.,** Manchester Street, Hull, Yorks.

The Ministry of Agriculture staged a helpful exhibit of How and What Not to Grade. Mr. E. Skillman was in charge.

There were visits to Noble Mushrooms Ltd.'s farm at Yaxley conducted by Mr. B. A. Noble (Managing Director), Mr. H. Peppercorn (Chargehand) and Mr. Fred. C. Atkins (Technical Director). This year a 5/- charge for admission was made; the proceeds totalled £35 and go towards the cost of building a much-needed Disease Room for the M.R.A. The plans are already before the Local Authority for approval, but more money is required before it can be equipped and put into commission.

Light refreshments and lunches were efficiently and tastily served throughout the day in the smaller marquee by **Mr. & Mrs. Lawrence Barker,** of Huntingdon and Peterborough. The licensed bar did good business under the amiable **Mr. & Mrs. F. Clark,** of the Norman Cross Hotel.

The lessons of 1950 had been learnt, and not only was there an efficient Car Park at the Station under A.A. control, but adequate sanitary accommodation had been provided.

Another great improvement was the " nerve centre," in a separate tent, staffed by Mr. Angus Watson (M.G.A./M.R.A. Secretary, who received many congratulations on the efficacy of his one-man efforts at organisation) and Mrs. M. Crowson (Secretary to Dr. Edwards). Not only was this Inquiry Office the scene of much activity—it served as a bookshop and sold among general mushroom literature André Simon's attractively-designed collection of recipes, entitled: " Mushrooms Galore," published that day.

As always on such occasions, much of the value of the day lay in the opportunity provided for firms to meet their clients personally and for growers to meet each other. This Bulletin hopes to publish in future issues a series dealing with innovations in the way of equipment, and here and now invites suppliers to submit details and pictures.

THE M.G.A. LIBRARY

Recent additions to the Library have been copies of André Simon's collection of recipes entitled *Mushrooms Galore; M.R.A. Report for* 1950, Presented by the Mushroom Research Association Ltd.; *Bulletin No.* 13 of the French Mushroom Growers, presented by the French Federation; *Mushroom News III*, 4 (April, 1951), presented by W. Darlington & Sons Ltd.; J. F. Barter's *Mushrooms and How To Grow Them* (1912).

ANNOUNCING A MAJOR EVENT . . . .

Mr. PHILIP HARBEN, the Television Cook, has kindly consented to be the Guest of Honour at the M.G.A. Mushroom Lunch at the Criterion Restaurant, Piccadilly, London, on Wednesday, 3rd October, 1951.

Licensed Reception at Midday.
Lunch at one o'clock prompt.
Tickets 15/- from the Secretary.
ANNUAL GENERAL MEETING follows at 2.30 p.m.

PHILIP HARBEN. Born 1906, *married* 1930. *Two children. Actor and Stage Manager* 1924-1928. *Cinematograph and assistant director* 1928-1929. *Commercial photographer* 1930-1938. *Entered catering professionally* 1938, *B.O.A.C. canteens and Test Kitchen. Formed own industrial catering company* 1947.

Television Cook since re-opening of service 1946; *number of TV demonstrations to-date* (*March* 1951) 120, *excluding odd appearances in Pantomime and Kaleidoscope, etc.*

Author of: THE WAY TO COOK, COOKING QUICKLY, ENTERTAINING AT HOME (with Mrs. Katherine Harben), TELEVISION COOKERY BOOK, THE POCKET BOOK of MODERN COOKING.

Recent films: "Boiling and Simmering" (Technicolor) for Electrical Development Association. "What's Cooking" with Terry-Thomas and Michael Bentine for the Gas Council.

Discoverer of Anhepsetal Cooking.

F. L. FILMER on The Paper Shortage

The Editor has asked me to write a word or two about Waste Paper Salvage. I myself am, of course, only too well aware of the need for waste-paper recovery because the box trade largely exists on it, but I hope I shall not appear to be grinding only my own axe.

There are a few points which I would like to mention.

Firstly, the term "waste paper" is a little misleading, because I have met people who take it literally and think old cardboard boxes, etc., are no use. In fact, anything which is paper or cardboard of any sort is wanted.

The reason for the present shortage is that there is a world scarcity of fresh woodpulp, caused largely by the Americans buying up the Scandinavian production. This scarcity of pulp results in the paper mills resorting to re-pulping waste paper to make up their deficiency. This has put up the demand for waste paper and created such a shortage that the board mills, who are the regular users, have now reached a point where they have had to shut down machines because they cannot get enough waste.

I have myself seen a two million pound machine standing idle at Thames Board Mills Ltd., and it is a most depressing sight when you think that it could turn out in a week or so enough board to satisfy the needs of the Horticultural Industry for a year.

It would help a lot if any member, whose local Council does not collect waste paper **and cardboard,** were to take the matter up. If the Council say they cannot make it pay at the price offered, then it is because they are inefficient, because there are plenty that can, even in the rural and urban areas.

Editor's Note : Reprints of this article are available free of charge from M.G.A. headquarters. Why not write for one or two and send them with your compliments to your local authority —making sure first, of course, whether they do *not* collect waste paper.

HOW LONG SHOULD WE

We used to crop our houses for 15 weeks. At that time, 10 years ago, we operated a 27 weeks' cycle, made up of 9 weeks from filling to first picking, 15 weeks cropping and 3 weeks to empty, sterilize and fill again. This meant that we cropped each house about twice a year.

We realised that 9 weeks from filling to first picking was excessive, and as we gained experience we were able eventually to shorten the period to 8 weeks.

At the same time we attempted to reduce the "turn round" period from three weeks to one, but we were constantly frustrated —and are to this day—by the irregular deliveries of manure. A delay of only one week may not appear to be a serious matter to the agents who supply mushroom growers with manure, but it means to us at to-day's prices a gross annual loss equivalent to one-third of our total manure bill.

One of the big attractions of a synthetic compost, provided its yield is as good as horse-manure, is the prospect it gives of our being able to fill a house on a given date.

Significant as that factor undoubtedly is, it is an aside in this short paper. I have said that we attempted to reduce what is somewhat illogically referred to as the "idle period," viz., the interval between emptying a house and its coming into crop again. We were in fact able to do no better than 10 weeks, compared with 11 weeks originally. Had manure deliveries been regular and reliable, we would require only 9 weeks.

We were not happy about our cropping period of 15 weeks, partly because production fell off during the later weeks, and partly because we were giving disease time to establish itself. Disease does not customarily become serious during the first half of the crop, and it appeared to us that the **maximum** output from any one house in one year could only be obtained if we somewhat reduced the cropping period. Against the increased cost of additional fillings we balanced the considerably reduced incidence of disease.

Our calculations were along these lines. According to our 1941-42 averages, we picked :

1·91 lb. per sq. ft. in the first 9 weeks
2·05 lb. in 10 weeks
2·17 lb. in 11 weeks
2·28 lb. in 12 weeks
2·37 lb. in 13 weeks
2·44 lb. in 14 weeks
2·51 lb. in 15 weeks

During the first International Conference on Mushroom Science in 1950, Mr. Fred. C. Atkins presented a paper on "The Economic Duration of Cropping," which is here reproduced from *Mushroom Science—I* by kind permission of the Editor :

ROP? Graphs: Jackson v. Atkins

If we left the house to crop the full **15** weeks we could crop $2\frac{2}{25}$ times a year, which at 2·51 lb. per crop would produce **5·22 lb. per sq. ft. p.a.**

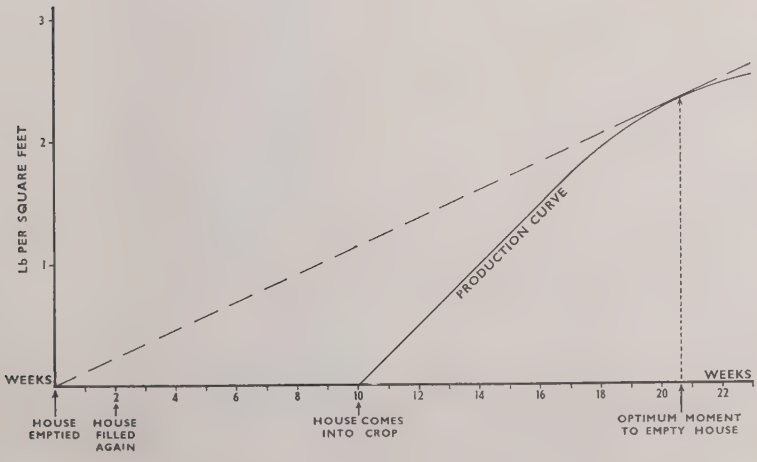
If we emptied after **9** weeks' picking we would be able to crop $2\frac{14}{19}$ times a year, which at 1·91 lb. per crop would **also** produce **5·22 lb. per sq. ft. p.a.**

Mathematically it could be found that the highest annual production would be obtained by cropping for **12** weeks. At 2·28 lb. per crop, $2\frac{4}{11}$ times a year, output would be **5·39 lb. per sq. ft. p.a.**

A simpler and more rapid method was devised by John Atkins. By plotting the progress of the house on a graph and drawing a tangent from the date when the house was last emptied to the production curve, one finds at the point of contact the optimum moment to empty again.

In *The Grower* of 24th March, 1951, Mr. R. L. O. Jackson discussed this paper in the following article entitled "Mushroom Graph Indicates When to Empty" :

A mushroom shed does not produce any crop for some weeks after filling. It usually then produces its heaviest flushes and later slowly tails away till it is obviously necessary to replace the old beds with new compost.



R. L. O. JACKSON

The exact time for emptying a house is often a matter for argument among growers. At the First International Congress on Mushroom Growing, Mr. Fred Atkins described a method of estimating the economic date for replacing an old crop with a new one, by using a graph showing the total pounds of mushroom a sq. ft. of bed plotted against time in weeks since the house was last empty.

This method, however, does not take into account the cost of purchase and preparation of the compost for the new crop, and would show the timing necessary to get the maximum weight of mushrooms a shed per year, regardless of the relative price of dung and mushrooms.

In some circumstances, four or five crops a year would produce the maximum yield, but the dung bill would probably not justify this rate of production.

NET VALUE WORKED OUT

By coincidence, the writer and a mathematically-minded friend were worrying about the same problem, and a joint effort resulted in the following method of judging the best time for shed-emptying.

Each week, the net value of the crop to date produced by a given house, is worked out from the salesmen's returns.

The total value of the crop up to that week is then marked on a graph (X, X, X) against the number of weeks passing since the last crop finished.

After some weeks, a curve joining these points can be drawn. This will be steep at first, indicating rapid production; later it will gradually bend over as production dwindles.

TANGENT IS DRAWN

Cost of preparing the compost for the next crop is worked out—dung, transport, turning and filling labour, peak-heating, casing soil and every expense up to the start of actual cropping. This cost is marked on the left hand side of the graph (at Y).

A straight line from Y is then drawn (geometrically, a tangent) just to touch the weekly production curve without being able to cut it in two places.

Only one such line can be drawn, and its point of contact (Z) with the production curve, read off in weeks at the base of the graph, shows the best time for emptying.

CROP MAY NEED REPLACING

The method is still open to some objection. A crop which is at its best during a temporary slump in prices may appear from the graph to need replacement before this is justified, because the increase in value of the crop has fallen off through low prices.

In the same way, a rise in prices due to a temporary shortage may make the curve rise more steeply than it should do, and falsely indicate a postponement of emptying.

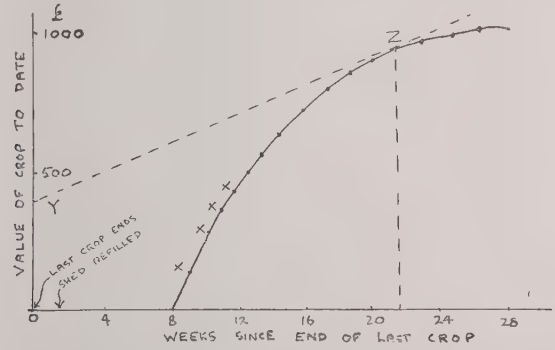
If a large increase in the number of crops a year has been indicated by study of one or two crop records, this may mean an increase in staff to handle the turning, etc., and the point Y, indicating expenses, would have to be moved up, thus altering the cropping time a little.

This method points out whether a 9, 12 or 14 week cropping period suits a particular holding and style of production best.

What does he say? In effect that my graph reveals only the maximum yield of mushrooms obtainable from one house in one year, whereas what the grower wants is the maximum profits.

And he proceeds to advance illustrated arguments in favour of an "improved" graph of his own devising which, at best, can tell us only that we ought to have emptied the house a week ago.

This is useless. It is essential to have the information at least a month before emptying, so that we may have time to obtain and prepare our compost for the next crop.



The curved line shows the net value of the crop from salesmen's returns. The cost of the next crop up to cropping is marked at Y and a line drawn to touch the curve at one point. The point Z where the two lines touch shows the best time to empty the shed.

Mr. Atkin's then wrote to *The Grower* the following letter, which was published on 14th April, 1951:

Mr. R. L. O. Jackson, in your 24th March issue, discusses interestingly the value of graphs to indicate the optimum life of a mushroom bed and makes certain comments on my paper at the recent International Conference on Mushroom Science.

It seems fantastic that one who has just published what your reviewer recently described as a "practical" book on mushrooms should have overlooked this point.

ENABLES US TO PLAN AHEAD

It seems equally strange that, with my paper before him, he should completely mis-interpret the purpose of my graph, which is to enable us to plan ahead.

I draw such a graph each year, the production curve being plotted according to the average of the two preceding years' crops. A graph so drawn tells us, with remarkable accuracy, when we should empty the following year.

Mr. Jackson goes on to criticise my graph on the grounds that it ignores the costs of production, and then admits that by bringing prices into his graph he weakens its reliability.

If he was working to such a graph last year, when the markets varied between 10d. a lb. and 5/6d., it would be interesting to learn how it functioned.

I say we cannot run a mushroom farm in this hand-to-mouth fashion. We must be able to plan ahead. My graph provides a sound basis for future programmes. With Mr. Jackson's our output is misgoverned by yesterday's prices.

After all, the price of mushrooms is the major factor we cannot control and, instead of letting it control us (as Mr. Jackson suggests), we should work for maximum output, knowing that it almost always gives the largest profit.

Mr. Jackson's comments were as follows :

Growers have to be "hard-headed." Even Mr. Atkins called his original article "The Economic Duration of Cropping." In some cases, cutting the cropping time to secure merely an ideal "maximum output" can result in uneconomic compost bills. A price/weight graph eliminates this major fault.

Mr. Atkins has mistaken what was intended to be a step-by-step explanation of the method of drawing one graph, for an amusing nonsense picture of a grower deciding that he should have emptied his shed a week ago.

EXPLANATION WAS TOO BRIEF

Perhaps I was too brief in my explanation, though grower-readers known to me did not make the same mistake.

Mr. Atkins draws an average graph of weights over the last two years or so. I recommend drawing a price/weight graph for each crop, and any grower who has kept picking charts and sales returns for a year or so can do this.

Looking at a series of these, and bearing in mind the season in which the crop will be picked, common sense will show an approximate optimum cropping time.

I, too, regard it as "fantastic" that any-one should think he can judge the crop while it is in the bearing state, on its record alone.

I openly admitted that this graph, like all economic graphs, has shortcomings. Prices do vary, though in my experience, they do not generally fluctuate so violently between 10d. and 5s. 6d. as Mr. Atkins makes out.

There are winter, summer, spring and autumn trends, but little serious rocketing. Perhaps, however, Mr. Atkins's markets are different.

Anyone can pick holes in any mathematical approximation to nature's laws, but I believe that a price/weight graph is one stage better than a simple weight graph.

Mr. Jackson's article and comments, and Mr. Atkins' letter, are here reproduced from "The Grower" with the Editor's permission.

Fred. C. Atkins Thinking It Over

THE DAYS AHEAD

What tricky times these are, to be sure!

The price of straw moving up steadily, and a frightful winter likely to result in even higher prices next harvest. It will make little difference if we use horse-manure or synthetics; the price will be UP.

Softwood almost unobtainable, even after the most protracted applications which usually end up with the use of alternative materials much more costly and far less satisfactory; yet a world surplus of softwood is forecast for 1951.

Sulphur suddenly a vital problem to the very existence of the nation's industry, yet research into alternatives has already produced results which could relieve the shortage.

Now we discover that one of the processes involves the use of gypsum, which is infinitely more important to mushroom growers than sulphur to-day. And the same day as I read about the gypsum threat there's a letter from the principal gypsum suppliers regretting yet another rise in its price.

Printing of all kinds becomes more and more expensive, and paper jumps 50% overnight. This Bulletin's advertising revenue fails to keep pace with costs, and we are compelled to increase rates to balance the Bulletin Budget.

Too many growers are reluctant to help in the prosecution of a progressive policy and we have to rely on the support of our salesmen and suppliers (who are those who make our Bulletin possible through their advertising). Already the Mushroom Industry owes so much of its success to their disproportional support that only with the utmost reluctance have we increased their burden.

The fact of the matter is, of course, that the M.G.A. income is not sufficient to allow the Executive to push ahead with any of half-a-dozen schemes which lie on its table. We cannot afford to subsidise the Bulletin, and the new arrangements are designed to make it self-supporting.

But the real answer is More Members. Here the Area Meetings can help and are helping. I have attended five of the first six to be held, and have been most pleasurably enlightened on the enthusiasm of growers as a whole. Future gatherings should be even more successful with the experience now gained by the organisers.

The one item which seems to crop up in all the informal discussions which characterise these Area Meetings is Publicity. We grow about ½ lb. per head of the population per annum—and do almost nothing to increase the demand.

Fortunately we have a most active Publicity Committee which, if not hamstrung by the absence of funds, would soon make its existence felt. Even as things are it is moving into action, and recipe leaflets will be available in a week or two to follow up the tasteful foundations laid by "Mushrooms Galore." Simons follows hard on Simon's tail!

You are all coming to the Mushroom Lunch at the Criterion on 3rd October, I hope, to hear Philip Harben, Television Chef and joint author with his wife of "Entertaining at Home."

This is a social event. As I said last year, why not give your wife a break from your moaning about the difficulties of growing and let her hear the other and altogether more enjoyable side—the eating of mushrooms, esteemed for thousands of years as "pearls of the kitchen." Afterwards Mrs. Grower may like to go shopping—and you can stay on with us to elect a new Chairman—not a scribbler this time, and one less prone than I to make your lives wretched with constant appeals for money, we all hope!

The M.G.A. may make mistakes. But you can scarcely criticise afterwards if the Policy for 1952 is decided in your absence. You may prefer to case a bed that afternoon. But there is a growing tendency to defer casing, so why not take time off to help make the M.G.A. bed upon which we shall all have to lie for the next 12 months?

How tiresome some people can be? Well then; take pleasure in welcoming my successor! Last year's 100 was a wretched turnout.

It IS *Psalliota bispora!*

B.M.S. Symposium on Mushrooms

At a Mushroom Symposium arranged by the British Mycological Society and held in the Burlington House rooms of the Linnean Society of London on 9th March, Miss E. M. Wakefield, the distinguished Mycologist at Kew, said she could not subscribe to the oft-repeated contention that the cultivated mushroom was derived from the Field Mushroom (*Psalliota campestris*) or the Horse Mushroom (*Psalliota arvensis*). She was more inclined at this stage to refer to it as *Psalliota bispora.*

Mr. Fred. C. Atkins, who opened the discussion, welcomed this authoritative support for a description he had advocated among mushroom growers ever since studying Dr. Cecil Treschow's masterly paper on the nomenclature of the cultivated mushroom. He added that the Mushroom Industry had also adopted the classification of White Plaster Mould as *Scopulariopsis fimicola* recommended by the British Mycological Society in preference to the

continued on page 212

CORRESPONDENCE

With such words as "crisis" and "dramatic" ever in the headlines of the press, it takes a deal to upset me. But I am truly astounded at the tiny response to repeated **appeals for funds** for the Research Station. I can only salute the few who have the vision to see the dead end to which the Industry will come in the next few years unless production costs are lowered and crops increased. I can only ask the M.R.A. Directors why they bother with the less intelligent when they themselves are so much on top of their job. (Don't tell me ; I know the answer !). I myself am so lacking in sales talk that if asked to address a body of growers on the subject of the M.R.A. I should only say : "Well, if you are such clots as not to be able to see that your whole existence as mushroom-growers on a profit-making basis depends on the successful outcome of research, then I am without sympathy for you." **A. E. CAVE.**

There was some correspondence in the *Daily Telegraph* recently on the assertion that lack of meat in our diet tended to cause anæmia. Miss Blanche Patch, in her memoirs of Bernard Shaw, had related that at one period of his life Shaw almost died of pernicious anaemia and had to be given liver extract over a very long period, even though he was a vegetarian. I wrote to the *Telegraph :* "Nowadays a vegetarian would surely include mushrooms or spinach in his diet, for both are recognised as being particularly rich in **folic acid,** the vitamin in liver which counteracts pernicious anaemia ?" My letter was acknowledged but not published—but it is worth our while at every opportunity to take up these points as they come into current prominence. Every little helps ! **FRED. C. ATKINS.**

As the leading users of the pressure-treatment system for ensuring adequate protection of timber, I feel it my duty to Growers to take up the matter of the faulty **oak boards** described and illustrated in your January issue. In doing so, however, I want to make it perfectly clear that we are not the firm of Timber Merchants concerned. Press photographs are not the best means of showing faults, but it would seem to me that the boards illustrated were "green" when sent for treatment and further they appear to be of low quality. In such a case distortion would have ensued, whether subject to preservation or not, although we ourselves would never attempt to treat low quality hardwood, or indeed any timber either hard or soft, in an unseasoned condition. This statement is made on the basis of fourteen years' experience of pressure treatment, covering thousands of standards of timber.

S. R. ATKINSON, *Managing Director, West Dock Timber Co. Ltd.*

Mr. MIDDLEBROOK

CONSULTS

March 25. Mushrooms looking like anaemic toadstools, small-capped spindly-stalked mushrooms, or no mushrooms at all are often the result of a greasy compost, says K. P. Barton in " The Smallholder." I can think of other causes too of the same phenomena.

April 6. How long does one deal with the kind of salesman who wires " . . . . . guarantee x/- for morning " then next day returns x/- minus 6d ? This happens so many times that one begins to question the integrity of agents. Is this not obtaining something by false pretences ?

April 12. Like sheep we are following the latest craze for peak-heating at Brayton. I was always doubtful of its value when employed indiscriminately and will only now concede its points where our new composting method is concerned—the process definitely calls for final inside fermentation. Unless one prepares composts with the final fermentation in the house in mind, it must be obvious that peak-heating may or may not be desirable. Hence the varying results, some extremely good, from a long series of crops that were not heated.

April 13. We have come across our first snag with concrete beds. In timber-bedded houses steaming produces compost temperatures which vary only 2 or 3 degress between top and bottom beds (even of 6-tier houses), but the variation on concrete is around 15-20 degrees, possibly more. I have yet to determine whether it is the coolness of the cement or the lack of aeration through it (beds are solid, not like open-spaced boards) that might explain the difference. Fans, even fairly powerful ones, don't seem to draw the extremes together.

April 14. I see " The Grower " is setting apart a section of the paper each week for the convenience of mushroom growers. All items, letters, articles, reports, etc., dealing with mushrooms will go into this section. I consider this further step in the recognition of the industry is another feather in the M.G.A's cap. Would it have happened if mushroom growers were still isolated units, hating each others' guts, as up to 1945 ?

HIS DIARY

April 15. In the absence of any marketing scheme or guaranteed growers' prices for mushrooms or any organised method whereby we can be enabled to sell at above cost and so make a profit, I suggest the solution is in our own hands. We should contact our salesmen every day to find out their price and their likely price for the next day (not their **guaranteed** price !). Then we should send only to the highest bidders and (most important) **tell the other fellows, the next day, why they didn't get any consignment.** The policy, so often advocated by commission men, of sending every day and if possible the same quantity every day is not always the best –except for the salesman. He will argue that he can do better for you when he knows he may expect regular supplies. He won't argue that this certainty of arrivals both tends to ensure his turnover and makes him slacken his efforts to lift prices. We all know how prices fall gradually until we give our man a jog. An occasional or perhaps fairly frequent reminder that his prices are too low and you won't send any more has a salutary effect. If we all sorted out and favoured our highest payers we should automatically raise the whole price average. The slippery man would get none unless he fell into line.

Two important points. First, there is no danger we should all end by sending to the same man in the same market. Markets fluctuate daily and district prices vary daily. Your " highest " man to-day may be the " lowest " a week later. Second, it is vital to be accurate and honest. A man must only be told his price is lowest when it IS lowest. Bluffing is fatal; it doesn't last, and you're sure to be found out.

April 19. I read in *The Yorkshire Post* that attendances at racecourses are declining at the rate of 10% a year. " As a result owners are finding it increasingly difficult to keep horses in training." After the heavy horse the racehorse looks like going. It will be left with the riding hacks to keep us going unless our research people can adapt the waste oils from our horseless carriages !

April 21. According to *Nurseryman and Seedsman,* in a report on a visit to W. Darlington & Son Ltd., Worthing, " It is possible (with trays) to get half again as much cropping area in a given house as with shelf beds . . . . . advantages seen . . . . . are ease of handling and drastic reduction in production costs." True it IS possible to add 50% to cropping area but is it **advisable**? So many growers complain of small mushrooms in trays and so many are cramming houses in this fashion that one cannot but wonder if it is a case of cause and effect. Less movement of air and considerably lowered air humidity are surely the causes of small fruit. As to drastic reductions in production costs, I wish someone would point out where they lie.

April 28. Someone is responsible for sending an inaccurate notice to the trade press. Several papers, dealing with our Yorkshire Area Meeting, report me as saying that our new composting methods have given us 1½ lbs. per sq. ft. in 13 days over 6 consecutive crops. The correct figure is 1 lb., not 1½. There is nothing outstanding about an occasional 1 lb. in 13 days—we have sometimes done it in 11—but we feel we have achieved something in being able to reproduce it in so many consecutive attempts. Another feature of this quick cropping is that the ultimate 10-week output is but little better than with other crops which have started more slowly. To those who use trays, quick early cropping has obvious advantages.

April 30. Two sides of a house were cased with the same soil, one side sterilized, the other neat. During the first half of the cropping period the unsterilized side was leading by about ¼ lb. per sq. ft. During the latter half the other side caught up and both finished about level. Whatever the explanation, and the raising of the pH by steam may be a part cause, it would seem here is another quickening means for use in trays—with our soil anyway .

May 1. I hear that crops of Rye throughout the country are not up to standard. Some pest, bug, eelworm, cecid, sciarid, truffle, *Dactylium,* bubble, or what-all . . . . . ! Well, who cares about Rye—we don't use rye straw? No, but farmers will use wheat straw for bedding cattle down instead of rye and up will go the price of wheat straw—if there's any left for the poor M.G. Our quite satisfactory M.R.A. synthetic is based on wheat straw. What comes next? We might have to postpone research on casing soil to go back to finding an available base for compost. I'm afraid it looks that way. Who can say there's no need for research. It's becoming more and more VITAL.

May 3. Open Day. Disappointing in numbers. But again the glorious chance of meeting old friends and chewing over the old solutionless problems. Always we are trying to be cheerful but I thought I detected a suggestion of underlying worry. What is it? Lack of compost? Lack of 3 lb. crops—with so many of 'em staring at us across the railway? Rising costs? I don't look too gloomily at the uture, but I'm bound to admit the worry of rising costs with decreasing spending power.

On the eternal subject of trays I heard one man describe how he tried

to curb his manager's enthusiasm for starting the system on a grand scale. "Can such men as Middlebrook be wrong?" he argued. My lukewarm acceptance of trays has apparently induced the caution intended. Even now, having tried trays for many months and having produced thereon quite encouraging crops I propose to go forward gradually. But I **can** be wrong, and too often am. Given an early-producing compost using a minimum of material, and an organising genius to marshall thousands of boxes into step with the remorseless clock (the former easier than the latter) I think the system could be an improvement on shelves. Without them it is mere sophistication or parrot-like conformity to make the change. Many, many growers are going over to trays. Some will succeed, some won't. One man told me to-day, with remarkable emphasis, "I wish to heaven I'd never started using the————things." He sounded as though he meant it.

May 4. I find absolute confusion on the question of peeling mushrooms in the new food book "Mushrooms Galore" (details from the secretary etc., etc., etc.). One expert says peel; another says on no account peel. Some recipes advise peeling large and old mushrooms but not small ones; others require small ones to be peeled. One forms the impression that for some dishes the peel is an essential ingredient whereas it would have a bad taste in others. Is peel so important? Can that thin filmy skin —so often almost impossible to separate from the cap tissue —make or mar a meal? We need some guidance; are we to continue advising our customers not to peel cultivated mushrooms—a good advertising point—or are we to tell them to find out for themselves?

May 9. A seven day compost has done 0·69 in its first five days. Two other similar composts have promising-looking first breaks.
May 10. To-day we assume the sacrificial status of our Research Director's guinea pig. We have been shot with *Mycogone* spores and then treated with various antidotes. We shall watch our progress with interest. We sincerely hope we recover.

May 11. Bank holidays inevitably interrupt the smooth progress of consignments to the markets, besides playing havoc with prices. A third unhappy feature is the effect they have on carefully-timed composting processes. Our short term composting demands precision timing with very little tolerance. Because of the holiday we are not able to steam and peak heat a house just filled. We are therefore holding it back—keeping it cold—until work re-starts and steam can be applied.

May 14. The latest strain of mushroom produced by the well-known firm of Spawnett, Pickett and Packett is to be known as the "Dome of Discovery."

THE CULTIVATED MUSHROOM

Morphology, Cytology, Developmental Cycle and Cultivation

by

ANDRÉ SARAZIN, Licencié ès Sciences

While operations are in progress for establishing the Experimental Research Station of the National Federation of Agricultural Syndicates of Mushroom Growers in France, I am publishing in this Bulletin, at the request of the President of the Committee, a digest of the general content of knowledge concerning the cultivated mushroom and its cultivation. There is no doubt that much of this knowledge belongs to the domain of pure science, but in what we hope to be the near future it may by degrees throw light on the various procedures which are still subject to the rule-of-thumb methods of empiricism.

In this survey I shall draw on the work which has appeared in French and foreign literature as well as on the results of my own work. The facts will be displayed as objectively as possible but in the light of my own interpretation. Criticism will be welcomed from readers who will thereby show their interest in these articles.

I shall endeavour to write in simple language, but where corresponding popular terms are not available, it will be necessary to use scientific terminology.

The work consists of two parts :

In the first part, consideration is given at the outset to the position of the cultivated mushroom in the Classification of Plants and to its presumed origin ; and following on this is the study of the cell of the cultivated mushroom through all its stages of development through mycelium and fruit-body ; and lastly, in the light of previous data, an attempt is made to explain the developmental cycle of the cultivated mushroom.

In the second part, the nutritional requirements and the environmental conditions of the habitat of the cultivated mushroom are set out ; and, using this information as a basis, an endeavour is made to explain scientifically certain procedures which experience alone dictates to mushroom growers during the cultivation of the crop.

The cultivated mushroom, and fungi in general, form part of an important category in the immense variety of plants which cover the earth. They are Thallophytes (plants with a thallus) which do not contain chlorophyll. Thallophytes consist of an assemblage of cells

Monsieur André Sarazin, of Carrières-sur-Seine, near Paris, is associated with his father in the famous French firm of Spawn-makers. The Sarazin family have been growing mushrooms for at least five generations, and are known to all growers on the Continent. Monsieur Sarazin himself graduated in Paris, and contributed strikingly original papers to the International Conference on Mushroom Science held in England in 1950. *His articles on the Cultivated Mushroom have aroused a great deal of interest throughout the mushroom world, and we are reproducing them in instalments in the M.G.A. Bulletin with the permission of the Author and of the Editor of the French Federation's Bulletin.*

The work of translation is in the able hands of Dr. C. J. La Touche, formerly Microbiologist with the Mushroom Research Association and now on the staff of Leeds University.

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arranged in various patterns, but they are not differentiated into root, stem and leaves. These thallophytes are without chlorophyll because they never have this pigment which is characteristic of green plants and which enables them to live by borrowing carbon from the carbon dioxide of the atmosphere. This is a very important fact, since the cultivated mushroom has to find its substance, food already prepared, in the form of the remains of higher plants (straw) and its significance will be apparent when the physiology of the mushroom will be under consideration.

It must not be forgotten that the edible portion of the cultivated mushroom is only the seed-bearing fruit-body (carpophore) of an extremely delicate, diffuse, threadlike (mycelium) plant which grows in the depths of the manure in the bed, and which is popularly known as mushroom spawn. In so far as the mycelium is made up of long cells arranged end to end but separated by a cross-wall the cultivated mushroom ranks with the class Eumycetes or so-called Higher Fungi.

The reproductive units, the spores, originate externally on specialized parent cells called basidia. This feature places it in the order Basidiomycetes, and the additional feature that the basidia are borne on an externally situated hymenium (layer of fertile cells bearing spores), which covers the radiating gills on the under surface of the cap, furthermore places it in the sub-order Hymenomycetes family Agaricaceae. The species was described by Fries under the name *Agaricus campestris*, cultivated variety. While the morphology of the cultivated mushroom is being studied the method of spore development will be described and it will be seen that two of them are produced by each basidium. It is curious that in the wild Agaric the number of spores on each basidium is four. This anomaly is not peculiar to the cultivated mushroom ; it is found in other basidiomycetes.

It is necessary to be reminded at this stage that what we mushroom growers call species, are only sub-varieties of the botanical species *Agaricus campestris*, cultivated variety.

Strictly speaking, the scientific designation of the Cultivated Mushroom should be *Agaricus campestris* (Fries) variety *bisporus* or cultivated.

The systematic position of the cultivated mushroom may therefore be summarised as follows :
Species : *Agaricus campestris* Fr., var. *bisporus* or cultivated;
Family : Agaricaceae ;
Sub-order : Hymenomycetes ;
Order : Basidiomycetes ;
Class : Eumycetes ;
Division : Thallophytes without chlorophyll, or Fungi.

It is rather widely asserted that the cultivated bisporic variety of the species *Agaricus campestris* Fries originated from the wild tetrasporic variety of the fields and that the reduction in number of spores per basidium is the result of abnormal conditions of cultivation (heat, humidity, constant darkness). In agreement with Cayley (1) (1938) and Kligman (2) (1943) I think this view is erroneous. The cultivated mushroom of to-day originates from a species of agaric which has always inhabited more or less fermentable manures and the wild tetrasporic agaric of the fields is a quite distinct species.

I brought about the germination of the spores of a specimen of the tetrasporic agaric which was collected in a field. The germination of the spores resulted in spawn and this was set in beds which were ideally suited to the requirements of the cultivated mushroom. The spawn never ran. On the other hand, this spawn was set in beds made up of straw compost which had been decomposed under conditions of low temperature fermentation by mixing it with a third part of black soil. In the quarries these beds produced fruit-bodies which on microscopic examination revealed tetrasporic basidia. The darkness, heat and humidity of the caves did not therefore bring about any variation in the character of the species. Moreover, the fact that for its development it requires compost fermented at low temperatures

serves to contrast this species physiologically with the cultivated mushroom species which is able to show only very poor growth under these conditions.

On endeavouring to set the spawn of the bisporic cultivated mushroom in the same habitat as that of the wild tetrasporic variety, namely, in sheltered grassy situations, I was able to obtain in the spring of the following year, a few fruit-bodies on the very sites of inoculation ; and, in fact, these mushrooms revealed microscopically only two-spored basidia ; thus no variation in the number of basidiospores was brought about by existence under natural conditions.

From these facts it follows that the bisporic cultivated mushroom may be normally considered to have always been a bisporic species, which, while it is related, to be sure, to the wild tetrasporic species, is nevertheless distinct from it.

The cultivated mushroom existed in the wild state before its cultivation in the 17th century by the French market gardeners, nevertheless its habitat appears to have been always manure or heavily manured soil, as is testified by early writings concerning mushroom cultivation and, in particular, the following extract from the Jardinier français edited in 1692 (Lavalle 1852) (3).

" Of all these species there is the bed species, which you can grow in your garden. And in order to do this, you must make a bed with mule's or ass' manure, placing on top of it fine manure called "terras " to a depth of four fingers, and after the peak temperature throw on to it all scraps and the water in which have been washed those reserved for cooking, and also all the old ones and those which have been worm-eaten or slug-eaten. This bed will yield you very good mushrooms, and these in a very short time ; this same bed will last you two or three years and will be good for making others . . . . "

And to conclude this arid dissertation on a more congenial note it might be of interest to our young pickers to read from this old treatise a homily, which, in the course of three centuries, has lost none of its worth :

" And the third (admonition) is to take care that, while picking the mushroom, you do not damage the stocks from which they arise which are full of a great number of germs, wherefore, in order to pick them cleanly and deftly, you must compress the stalks between the fingers with the hand reversed, the while steadying with the other hand placed on the soil, in order that when picking the mature mushroom you do not eradicate the stock."

(to be continued).

1. CAYLEY, DOROTHY M. The History of the Cultivated Mushroom. Gardener's Chronicle, CIV, 2690, 1938. Journal of the Royal Horticultural Society, IXII, 7, pp. 325-333. 1938.

2. KLIGMAN, ALBERT M. Some Cultural and Genetic Problems in Cultivation of the Mushroom *Agaricus campestris*. Fr. American Journal of Botany, 10, December, 1943.

3. LAVALLE, J. Traité Pratique des Champignons comestibles. Paris, 1852.

HOW TO AVOID TROUBLE

There is nothing in this article which is particularly original, but I think there are some things which growers know or have known, but do not always fully appreciate and put into practice.

One usually thinks of trouble in terms of pests and disease. The common pests, Phorid and Sciarid flies, springtails, Cecid larvae, mites and eelworms are particularly well described by B. D. Moreton in M.G.A. Bulletin No. 20, and more briefly in most general books on mushroom growing. The three main parasitic diseases and some competitors are described by F. C. Atkins in " Major Diseases and Competitors " ; by H. H. Glasscock in Bulletin 34 on " Mushroom Growing " ; and in other books. There is no need to cover that ground again, and my object is to consider the practical use of our knowledge of them. I know all growers cannot apply all the possible measures to prevent attacks, but better knowledge of the methods available may help them to find the best compromise under their own conditions.

The conditions in a mushroom house are intended to be ideal for the mushroom, which is a fungus, and they must be almost ideal for many other fungi as well, once they get into the house. The most effective control is, therefore, to prevent entry. With people going in and out of houses daily carrying tools, compost, soil and mushrooms, there is every opportunity of carrying into the house anything which they can pick up on the farm premises as a whole. Good hygiene in the house is not enough. The object should always be to prevent any colony of disease organism or competitor establishing itself anywhere on the farm premises. To do this, concrete is the greatest single aid and it should be washed down regularly and frequently. Other steps well worthwhile are disinfecting all tools and the handles and edges of doors where workers may touch them; disinfecting the composting ground; all workers handling casing soil or going on the site where it is dug should disinfect their boots. Tools and containers used on casing soil should be kept for that purpose only and should not be used on fresh or spent compost.

Similarly it is best to keep a set of tools especially for handling spent compost, or if the farm is too small to justify that, they must be thoroughly washed in formalin before each change from spent to fresh compost.

Stools used in the houses should be disinfected regularly.

In the following article Dr. Edwards discusses some of the reasons why things go wrong on a mushroom farm. He has recently addressed two meetings on this subject: the M.G.A. Refresher Course and the Yorkshire Area Meeting.

Dr. R. L. Edwards, Director of Mushroom Research

It is important to make all these cleaning jobs part of a weekly or daily routine; if they are done "when there is time," they will often never be done, as the Irish might say.

Inside the house the loss of one mushroom to a parasitic disease, particularly *Verticillium*, is insignificant, but the damage it may do by spreading infection is not.

Practical experience on several farms has shown how these isolated mushrooms spread infection.

If you can catch the first mushroom before it starts scattering spores you can enormously reduce the risk of losing many more during the rest of that crop and in future crops.

This spread is best prevented by having someone whose daily job is to inspect all beds in production, and disinfect and remove all diseased mushrooms before pickers enter the house. This "disease spotter" should do no picking and the pickers should never have either the chance or the need to touch a diseased mushroom.

Disinfection is usually done by spraying the diseased mushrooms and about a foot of bed round them with 2% formalin, or sometimes by scorching with a flame gun.

These measures, none of them terribly difficult if you make up your mind to it, will prevent any serious development from casual infection. Naturally if your casing soil is infected with *Mycogone* to start with, as many surface soils are, it must be sterilised, either by steam or formalin.

House conditions are important in the spread of disease. The three parasitic diseases do not spread as rapidly, and may completely fail to attack mushrooms when spores are present, in a house with high air/bed ratio and temperatures and humidity both on the low side, say 55° F. and Relative Humidity below 80%. I know this conflicts with economic needs, but their relative importance rather depends on local circumstances.

The use of fungicides to control diseases, which is increasingly practicable, should only be regarded as a secondary line of defence against disease. The result of insufficient care in the first place is shown by the state of some farms abroad where for example one hears of 20% diseased mushrooms in the first flush, and nearly 100% by the fifth, with *Verticillium*, *Mycogone* and *Dactylium*.

Apart from diseases which attack mushrooms on the bed

there are other fungi growing on the compost and soil which may injure the crop. They are out of sight and hence often out of mind; and it is more difficult to be sure whether they are doing any harm. Truffle is probably the most dangerous of these fungi, and it can be very destructive. Others are the Plaster Moulds, Vert de Gris and Red Geotrichum.

It is uncertain whether many of these fungi are directly harmful to the mushroom, or merely evidence of faults in the compost, or both. This question obviously interests advisory and research workers, though it may be less obviously important to the grower. It seems probably that faults in compost do at least encourage some of these fungi, and may be necessary for their growth. However this may be, every effort should be made to discourage them by correct composting, and to reduce to a minimum the risk of carrying them over from one crop to the next.

Lorries are a particularly dangerous source of infection. If they are used for all purposes they must be disinfected after each job, particularly after carrying spent compost. If Truffle is known to occur on the farm it is highly desirable that the same lorry should not be used for spent compost and either fresh compost or casing soil, because there is, at present, no reliable means of disinfecting the lorry after contamination with Truffle spores.

Pests

Much can be done to reduce the pest attack by similar attention to general hygiene and in the case of eelworms and Cecid larvae, this is almost the only defence we have. Phorid and Sciarid flies and springtails can be effectively controlled on shelves, trays or floor beds on concrete by BHC, either applied just before peak-heating at 1-2 lb. 5% dust per 1,000 sq. ft. or, in the case of floor beds particularly, mixed in the compost at 1 lb. per ton of compost. Many mites can be controlled by HETP and some by BHC. It is important to know how much of these things you are putting on the bed; some of them can injure the mushroom crop. It is not necessary to weigh them every time, but you should either use a convenient measure or know the capacity of your dusting machine or sprayer.

Tray System

Nowadays there is much discussion about the merits of the Tray System and some remarks may possibly be helpful. I think it is very much what the individual grower makes of it. To be a success, first-class organisation is vital and some mechanisation is almost essential. It makes greater demands on ability as a grower, and if things go wrong on the growing side the damage is liable to be greater than it would be with shelves.

In addition to all the ordinary risks some others have turned up. Some growers have had trouble with creosote and it is not yet certain whether this is due to the very close packing of boxes or to the use of unsuitable quality creosote. There is a serious danger, particularly in warm weather, of excessive temperatures developing during peak-heating and spawn run. Boxes

should be spaced, preferably in single rows, so that they can be air cooled if necessary and they should be watched to see that the bed temperature does not exceed 140° F. during peak-heating, and 75° F. during spawn growth.

The Tray System should not be regarded as a method of raising the bed area in a house. In most mushroom houses fitted with shelves this was already high enough and any increase will lead to a slower and smaller yield, particularly in summer.

Some modern houses have air space to spare and will take a greater area, either in trays or shelves.

I would prefer a 2″ gap between boxes to the customary 1″, as there is much less risk of overheating during pasteurization and and spawn run, and less risk of uneven compost touching the bottom of the boxes above, and so interfering with ventilation which is necessary in small amount.

Emptying a shelf house is always a messy business, and if disease is present it is almost impossible to avoid scattering some spores. One of the advantages of the tray system is that the trays can be carried out with no dispersal of spores in the house, and emptied with a minimum of risk outside the house or right away from the farm.

Watering

I think watering is the trickiest job in mushroom growing. It affords most scope for skill or mistakes and should be treated with suitable respect.

You may be fortunate in having a soil which gives good results

"Good Hygiene in the house is not enough" says Dr. Edwards

under a considerable range of treatments. Even the best soils can give poor yields, and they will respond to good treatment. At the other end of the soil scale are poor soils which only give a crop at all if they are treated just right. So be careful in your watering, and do not rush it by using a heavy rose which may beat down the soil or run through it.

New methods

Some people can never let well alone and must always be trying something new. Such a thirst for knowledge is quite a healthy state of mind, but it must not be allowed to run wild.

If you are getting satisfactory yields take particular care to do exactly the same thing each time, and if you want to try variations do it on a very small scale.

If you are not getting good yields do not rush in and change everything at once. Have a good hard think first and see if you can associate a drop in yield with one or two changes in methods. If you ask for outside advice give your adviser a clear statement of everything you do, and particularly mention any change.

It does not follow that because one grower successfully does things in a certain way, others can too. There are still many unknown factors, and it is wise to be as careful in adopting other people's methods as you would be with completely new ones.

Use of research

Growers should realise that much of the initiative in *using* technical advances must come from themselves. The day of the old-fashioned grower who always followed his father's methods and never learned anything from print has gone. The successful grower to-day is permanently on the look out for anything new which may help him; not to jump blindly at every novelty, but to study it critically, appreciate what it means, how it works and what it can do for him, and then see how he can apply it. If the effort needed to do this is too much trouble he will gradually fall behind as others take up and apply the new knowledge which is rapidly being gained and spread in all sorts of ways. Much of it is highly technical, but its practical applications are usually available in everyday language. Research and advisory workers are always ready to explain them to growers who are interested or in difficulties.

Advice when in trouble

Finally, if you are in trouble ask for help early. Do not wait until you have a house over-run with pests or diseases. At that stage it is more difficult to put things right.

The M.R.A. does its best to help subscribers; the M.G.A., though without laboratory facilities, does all it can for its members; and the N.A.A.S. is steadily improving its service for all. County Horticultural Officers cannot all become mushroom experts, but they have some experience, which the grower may lack, in looking for the cause of trouble. If you can get your county officer even mildly interested while things go well, so that he knows what normal things look like, he may be better able to ask you the right questions when things go wrong and help

contd. on page 197

No N.A.A.S. Specialist Exclusively for Mushrooms

There was strong support at the last Annual Meeting of the M.G.A. for General Sir Oliver Leese's resolution that the Ministry of Agriculture appoint one person, the greatest expert they can find on mushroom growing, to advise growers, and the new Chairman agreed to approach the N.A.A.S.

Mr. Fred. Atkins wrote to Mr. C. E. Hudson, N.A.A.S. Horticultural chief, on 7.11.50 : " I was very pleased to have the opportunity on Friday of speaking to you on the subject of an advisory officer in the N.A.A.S. devoting his time solely to Mushrooms.

" Ever since the N.A.A.S. was inaugurated the Executive Committee individually have been at pains to know their Provincial Horticultural Advisers personally, and on many occasions we have urged growers to establish close, friendly relations with their local advisers. Nevertheless there has always been at the back of our minds the thought that, except in the two or three counties such as Sussex and Yorkshire where mushrooms are grown in quantity, there is little chance of the advisers gaining sufficient experience to tackle more than the most elementary problems.

" At your suggestion we have gladly co-operated (and will of course continue to do so) in Refresher Courses designed designed primarily for Provincial Advisers, but in one or two days in a year we can do no more than run over the latest ideas and practices. After a man has been growing mushrooms every day for two or three years it seems unlikely under the present arrangement that the N.A.A.S. will be able to help him much.

" It was this widespread feeling which prompted such unanimous support at our Annual Meeting on 4th October for a resolution to the effect that we seek your support for the appointment of a specialist mushroom adviser under the N.A.A.S.

" Such a man could be centred at Yaxley, or a frequent visitor to Yaxley, and I can assure you that the leading mushroom growers in the country would be only too pleased to assist him in every possible way. As a liaison officer between the Research Station and the Industry he would soon prove invaluable to us and travelling around the country from farm to farm investigating growers' problems he would rapidly acquire an unrivalled insight into our difficulties.

" I can imagine no single step which would so increase the efficiency of the Mushroom Industry and enable us to face the inevitable fall in prices which has now been going on inexorably at the rate of 1/- a lb. for the past four years.

" I hope you will give this matter the fullest consideration. I know you will regard it sympathetically."

Mr. C. E. Hudson replied on 15.11.50 : " We have discussed the resolution passed at your Annual Meeting on 4th October, asking for the appointment of a specialist mushroom adviser under the N.A.A.S. I realise that the specialist advice on this subject has not been covered in one province as we had no adviser on glasshouse crops and vegetables. We are hoping to appoint a man who is due to take up his duties on 1st January.

" We feel that the provincial advisers responsible for glasshouse crops and vegetables can normally deal satisfactorily with the more specialised problems of the mushroom growers, especially as we are hoping to maintain a closer association between our advisory officers and your station at Yaxley.

" It may be that, in one or two of the mushroom-growing counties such as Sussex and Yorkshire, it would be desirable for the Senior Horticultural Officers from these counties to join the provincial advisers at the refresher courses at Yaxley.

" We do not think that the provision of special advisers on individual crops, whether mushrooms or plums or sugar beet, is the right way to go about things."

RESEARCH FUND, 1951

Still £350 Off the Target

Very encouraging progress has been made since the last Bulletin went to press, and the total stands at £1,143. Our Target for 1951 is £1,500. It is hoped that those who have not yet contributed will send a cheque along without yet another reminder or exhortation.

Particular reference must be made to the handsome contributions received from **Mr. E. Buttikofer,** of Switzerland, whose acquaintance we were most happy to make during the recent International Conference ; **Messrs. John Beveridge & Co. Ltd.,** of Scotland ; and **Messrs. Geo. Monro Ltd.,** of Waltham Cross. Each sent a cheque for £50.

The Chairman's letters of acknowledgment followed these lines : " Contributions are now coming in too slowly for any complacency to be entertained over the future of the Yaxley Station, and gestures on this scale give us courage to persevere in our efforts to keep the research flag flying."

The Thwaites' Group is always quick off the mark to send its usual Ten Guineas from each Company.

Messrs. W. Darlington & Sons Ltd., of Worthing, sent us 25 guineas, and **Mr. Stanley Middlebrook,** of Selby, and **Mrs. M. B. Young,** of Northern Ireland, £25 each. **Messrs. A. G. Pointing** (Agaric Ltd.), **F. L. Filmer, H. Mount & Sons Ltd.,** and **S. J. Pointing** each contributed £20.

To these generous donors and the others listed on the next page, the Board of Directors expresses many thanks.

List of Subscriptions received from 1st February, 1951—7th May, 1951

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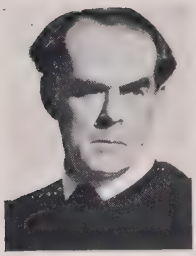
Each month we receive the following on Bankers' Orders :—General Sir Oliver Leese £2 10s. 0d. ; Heather Farm Ltd. £1 10s. 0d. ; H. Kilian £1 5s. 0d. ; Kildare Products £1 0s. 0d. ; Col. W. A. Turner 10s. ; R. H. White 10s. ; and W. Makowski 5s.

HOW TO AVOID TROUBLE—*contd. from page 194*

you to find the cause. Failing that he has the Provincial staff behind him.

If you call in any of these people early they may be able to deal with your trouble before it does serious damage. If you leave it too late you may lose that crop and store up trouble for future ones.



Photograph from "My Three Inns," reproduced with permission of Chatto & Windus and of Readers' Union

"MU

This is a charming little book* containing all known mushroom recipes (though some of them differ from others only in name) and some new to me which I shall try at once, e.g. Mushrooms sur le plat, au gratin (without the chives), and with noodles which should be delicious as well as economical.

But recipes where mushroom is the main thing are naturally few. Most of the book has them as garnishings or adjuncts, in one case even "optional."

Many universal dishes are glorified with French names. Our bacon and eggs and mushrooms comes out as "Champignons Ermenonville," what do you know! and stewed rabbit "Lapin en blanquette" and "chasseur."

Many of them are useful, "green eggs" and "vol-au-vent surprise."

Then the usual sauces. Isn't a fuss made about cooking Béchamel? Mixing flour in cold milk, pouring it into boiling, with butter, and stirring till it thickens (i.e. cooks) is quicker and the same in the end.

I feel that, since the mushroom has so precious a flavour, it is a mistake to add anything that kills it. I count thirteen such, vinegar, garlic, lemon and so on. Truffles yes, but they are expensive and would fit only those recipes for pigeon, turkey, chicken livers and snipe!

As to practice—we are told to skin and not to skin, and one recipe skins the cultivated and not the field mushrooms. Normally I should have thought the reverse. One recipe tells us to soften the skins by throwing over them three kettles of boiling water! Oh, these recipe makers.

Then, **can** they be pushed through a sieve? Only with awful labour, and when done that way as recommended for soup, the result is a lot of little bits like a grey rash floating on the top. My way is to press the well boiled stuff through a potato masher to the last drop.

No mention is made of mushroom sauce so wonderful for chicken. Here too I use the masher, throwing away the now quite tasteless fibre.

*"Mushrooms Galore" (published by Newman Neame Limited) is available from the M.G.A. at 5/-. It makes an inexpensive and most acceptable present for mothers, wives, sisters, daughters, cousins, aunts and anyone else who cooks.

John Fothergill, "England's most celebrated innkeeper," reviews Andr[e] Simon's collection of recipes

IROOMS GALORE"

And do mushrooms really soften by cooking? No. They are at their tenderest and tastiest raw, and I've sometimes made a salad of them sliced with sliced lettuce, salt and cream—it's lovely! So the less time they are cooked the better, say three minutes, if even that.

Are Monsieur Simon's economics correct when he says a greater demand would mean greater supplies and lower prices? The greater the demand the higher the price is the rule. I would think that the grower, with the distributor's co-operation, should first sell at the lowest possible profit till they create a taste for their " fruit " when a just equilibrium will follow.

Coming-out Party in London

Press Reception for " Mushrooms Galore "

Messrs. Newman Neame Ltd., the London publishers of " Mushrooms Galore," held a coming-out party for the book on 1st May, in the rooms of the Wine and Food Society in London. It was attended by about 60 representatives of the Press, including nearly all the national women's journals.

COMPTON MACKENZIE, the famous novelist, to whom *Mushrooms Galore* is dedicated accepts a spiked mushroom and a glass of champagne from ANDRÉ SIMON

ANDRÉ SIMON toasts mushrooms at the reception. With him (L. to R.) are MRS. FRED. ATKINS, MISS GEORGIE RODGERS and MADAME SIMON

Miss Georgie Rodgers, Principal of the "Good Housekeeping" School of Cookery, had prepared with her staff a delectable selection of six recipes from Monsieur Simon's book and one specially concocted for the reception by (it was suggested) Mr. Compton Mackenzie, to whom the book is dedicated, named "Mushrooms Galore." (It will be recalled that one of the best recent films was "Whisky Galore," based on Mr. Mackenzie's book and in which the author himself appeared.)

Both Mr. Geoffrey Neame and Mr. Harry Newman were present to welcome the guests with a copy of the book and a glass of champagne.

Mr. Compton Mackenzie warmly congratulated his old friend André Simon on his latest publication. He referred to him as a cornucopia of good things to eat and drink -" and cornucopias are rare to-day" (hear, hear). It always did him good to meet André Simon. One felt instinctively that all was still well, that there was plenty of good wine and good food in the world after all, and that he would go on for ever.

Mr. Mackenzie confessed he liked mushrooms. Even their name was romantic, suggestive of cupolas, domes and moonlight, and dawn expeditions through dewy meadows. He regretted that, except perhaps in the Hebrides, wild mushrooms were becoming scarcer, and he wondered whether the growers would one day produce morels—though these, eaten in excess, had once sent a friend of his to sleep for several days. (Laughter).

M. André Simon, in reply, said he had collected these recipes at the request of the Mushroom Growers' Association and because he too liked mushrooms very much and wanted as many other people as possible to know the various ways of preparing them. Mushrooms were cultivated throughout the year, but it was in the interests of both housewife and grower that there should be more mushrooms. He had been told—and he always believed what he was told (laughter) —that only if the demand increased would growers be encouraged to extend their farms and so be able to reduce their costs. Demand would certainly increase if it were more widely appreciated that mushrooms were a food and not merely a pleasant taste.

He called on Mr. Fred. C. Atkins, who wrote the preface to "Mushrooms Galore," to speak as Chairman of the Mushroom Growers' Association (who supplied the mushrooms for the reception).

Mr. Atkins admitted to some diffidence after Compton Mackenzie's reprehensible remarks on the abhorrent wild mushroom (laughter), adding : " Although we have not yet reached the stage when we can grow morels commercially, we do occasionally grow a few clitocybe which, it is reported, send one into a frenzy of singing and dancing " (Renewed laughter).

The production of mushrooms had been doubled in the past 10 years and the price had been falling steadily. He asked them to realise that the grower spent several months in preparation for his crop, yet the price he received for his mushrooms was only half what the housewife had to pay when they reached the shops.

After congratulating the publishers on a beautiful production and André Simon on yet another work which was as excellent as they had expected, Mr. Atkins made two observations. " Firstly, I am completely baffled as to why everyone seems determined to peel mushrooms," he said. " Some of the tastiest mushrooms won't peel without an appalling wastage. And secondly, I am genuinely distressed at the equal determination to cook mushrooms when, on salad occasions, they are delicious in their raw state."

Accompanying Mr. Atkins were Mrs. Atkins ; Mr. J. Stewart-Wood, Vice-Chairman of the M.G.A., and Mrs. Stewart-Wood ; Mr. A. DeB. Hovell, M.G.A. Chairman 1950 ; Mr. J. E. R. Simons, Chairman M.G.A. Publicity Committee ; and Mr. Angus Watson, M.G.A. Secretary.

Extract from the Applied Mycology, April, 1951.

The mushroom grown for food in Bangkok is a *Volvaria* sp. and when it is grown in horse dung or rice straw a crop of a rooted *Coprinus* sp. develops abundantly five to seven days before the *Volvaria*. It is very delicious. The cap is 3 to 4 cm. in diameter, at first white and cylindrical later bell-shaped or expanded and pale brown on the top, smooth, and with a notched or lobed margin. The young stem is 5 to 6 cm. long, white, smooth, hollow, and lengthens out into a root-like structure. As the plant matures the stem becomes more than twice as long ; at this stage the cap deliquesces. The fungus is usually very short-lived, and grows naturally on dung, richly manured ground, or rotted grass. It does not appear to have been named specifically, and the author suggests *C. radicatus* (without a Latin diagnosis).

VATNA (S.) The rooted Coprinus. —Collected Papers presented at the Science Conference, 1949, sponsored by the Science Society of Thailand, pp. 25-30, 1 fig. (? 1950. Thai, with English summary).

INDEX FOR BULLETINS

At the request of the recent Epping Area Meeting, an exhaustive classified Index has been prepared by Mr. Fred. Atkins for M.G.A. Bulletins 1 to 23 and should save much time in the exasperating search for elusive information. It has been printed and circulated to all members.

MUSHROOM GROWERS GET TOGETHER

Area Meetings in Selby, Salisbury, Aylesbury and Tenterden

"These Area Meetings are still experimental, and I must congratulate you who grow here, and your enterprising N.A.A.S. Officers, Mr. Sayer in particular, for combining an informal Farm Walk with a more formal meeting this afternoon—and on an excellent lunch," said Mr. Fred. C. Atkins, M.G.A. Chairman, during the course of the Yorkshire Area Meeting on 10th April.

About 100 growers assembled at Highfield Farm, Brayton, and were shown the modern methods of cultivation practised by Mr. Stanley Middlebrook, of the M.G.A. Committee, who made the local arrangements for the meeting. Mr. Middlebrook was introduced by Mr. W. Humphrey, Chairman of the West Riding C.A.E.C., as one of the pioneers of mushroom growing in the North of England. Those present certainly saw much to admire at his fine modern plant, and were particularly impressed by the unorthodox composting procedure a compromise between rectangular and ridge shaped stacks — which over the past half-dozen crops had produced 1 lb. per sq. ft. in 13 days.

(*Mr. Middlebrook has consented to contribute to this Bulletin's series entitled "My Way of Growing."*)

After lunch together at the Londesborough Arms, a meeting was held in the Museum Hall, Selby. The platform had been beautifully decorated with flowering plants from Mr. Middlebrook's nursery, and it was fitting that he should form the centrepiece in the capacity of Chairman. With him were Mr. Atkins; Dr. R. L. Edwards, Director of Mushroom Research at Yaxley; Mr. H. W. Sayer, local horticultural adviser; and Dr. I. F. Storey, N.A.A.S. provincial plant pathologist, who later opened the discussion.

Mr. Atkins spoke on "Problems facing the mushroom grower today." For the benefit of non-members present, he first outlined the history of the M.G.A. and went on to refer to difficulties which had arisen from time to time and what steps had been taken to overcome them. It had become obvious that we must increase our production per square foot or per ton of manure or both. The costs of production were three times what they were immediately before the War, the most serious item being wages. These had been going up by 1½d. every week for the past 12 years, and in an inflationary environment there seemed no prospect of a halt being called.

He did not wish to give the impression that the mushroom worker got too much money. He did not; he had so many finicky little jobs which, done carelessly, could very seriously interfere with production.

Who but an experienced and skilful worker, for instance, could be trusted to water a bed with safety? Nevertheless, the economic fact remained that wages could not go up and up, and prices come down and down, without compensatory increases in our efficiency.

It was one of the primary objects of the M.G.A's Area Meetings to provide opportunities for growers to get to know one another better and, by realising more clearly the common nature of their difficulties, be able the better to tackle them. If a problem required national action, a strong Area could make powerful representations to the Executive Committee and inject a little ginger into headquarters.

Speaking of specific problems besetting growers, Mr. Atkins said Government policy to-day appeared to be one of limited encouragement of existing mushroom farms, and unlimited discouragement of the building of new mushroom farms, even when the intending growers was highly experienced. It was not merely a matter of the shortage of softwoods; this could largely be overcome by the use of alternatives, even where no controlled material was to be used. The major obstacle seemed now to be one of **capital investment.** Apparently only a limited sum might be spent within a given period on agricultural buildings, and the appropriate authority had simply to say this sum had been licensed for the application to be rejected.

"I need not tell you that the M.G.A. is endeavouring to find out just how we stand," he added, "but these things take time, and we were not aware of these new circumstances until a week ago."

Timber was difficult. A small quantity of imported softwood had been allocated to mushroom growers, in consultation with the M.G.A., for the replacement of decayed shelving or the making of mushroom trays, and as far as was known this was still the position. Officially, no imported softwood had been available since the War for **new building,** even on an existing farm, but small quantities had been released from time to time.

The **fuel** situation was also difficult, but should ease any time now, when the warmer weather arrived. A number of cases brought to the notice of M.G.A. headquarters recently had been settled satisfactorily upon approach to Regional Fuel Offices. In every case the N.A.A.S. had been most helpful. Fuel difficulties usually arose through the grower's failure to apply in the first place to his local horticultural advisory officer for an allocation. Most growers had an allocation authorised by the local fuel office, but it behoved them all to look into the question this summer and to get in stock for the winter as much of their annual allotment as finances permitted during the next six months.

The M.G.A. had made forceful representations several years ago for fuel allocations on the same basis as those accorded to glasshouses, and mushroom growers were now entitled to 180 tons of anthracite

per acre of ground area of mushroom houses—and when anthracite was unobtainable, to three tons of coke (being of lower thermal efficiency) for every two tons of anthracite not supplied.

"This satisfactory agreement with the Ministry of Fuel was negotiated by the M.G.A. through the National Farmers' Union," said Mr. Atkins, "and I always like, on occasions like this, to express the appreciation of the M.G.A. to the efforts made on our behalf by the N.F.U. at Bedford Square. We work together very amicably. Without the N.F.U. the M.G.A. would be too small an organization to carry any weight in governmental deliberations. Without the M.G.A., on the other hand, the N.F.U. would be unable to gauge the requirements of the Mushroom Industry and the peculiar nature of the problems which beset us."

Mr. Atkins touched on a number of cultural problems and invited questions.

Mr. Angus Watson, M.G.A. Secretary, referred briefly to the various textbooks and papers now available, and said he would always be pleased to see growers at Yaxley—but particularly on the occasion of the Research Station's Open Day and the Mushroom Trade Show (reported elsewhere in this issue).

Dr. R. L. Edwards gave a most helpful talk on "How to avoid trouble." (At the suggestion of the Editor he has revised this for more general consumption, and it is reproduced on page 190).

SALISBURY DISCUSSION

About 30 mushroom growers in Wiltshire, Hampshire and Dorset met in Salisbury on 3rd April, to discuss current difficulties with officers of the Mushroom Growers' Association.

Among the matters discussed were problems connected with the building development of mushroom farms, the shortage of superphosphate, fuel allocations and the necessity for publicising mushrooms, one suggestion being that, now and then, recipes should be slipped into the chips going to market.

Mr. Fred. C. Atkins, Chairman of the M.G.A., presided, and with him on the platform were Brigadier J. S. Nichols (who made the local arrangements), Captain G. P. Lawrence (Area Executive Member), Dr. R. L. Edwards (Director of Mushroom Research) and Mr. Angus Watson (M.G.A./M.R.A. Secretary).

All the company later had dinner together at the Cathedral Hotel.

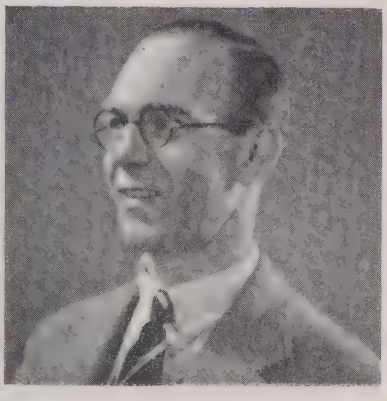
MECHANISATION AT AYLESBURY

Another of the Area Meetings being arranged this year all over the country by the Mushroom Growers' Association was held in Bucks. on 12th April.

Mr. John Stewart-Wood invited members and others interested in the industry to Aylesbury Mushrooms Ltd., at Ford, where he is growing extensively on the Tray System. His staff demonstrated the Compton Hydraulic Loader lifting enormous forkfuls of compost from the stack into his Salopian Manure Distributor. By mechanising in this way he had reduced his composting labour bill by more than one half. Dinner was provided at the Bull's Head, Aylesbury, where Mr. Stewart-Wood, who is Vice-Chairman of the M.G.A., introduced the guests : Mr. Fred. C. Atkins, the present Chairman, and Mr. Angus Watson, M.G.A. Secretary.

There was a long and thorough discussion on a number of current problems, including fuel, synthetic composts, the moisture-content of composts, the Tray System, and alternative means of heating mushroom houses.

TENTERDEN WALK



The second meeting of the progressive Kent, Surrey and East Sussex Area was a " walk " around the Tenterden mushroom farm of Harding Brothers in Kent, on Saturday afternoon, 21st April.

Over 40 attended, comprising the M.G.A. Chairman, Mr. Fred. C. Atkins, and Mrs. Atkins ; Mr. J. E. R. Simons, Chairman of the M.G.A. Publicity Committee, and Mrs. Simons ; grower members and their wives ; Mr. A. D. Harrison, N.A.A.S. provincial glasshouse adviser ; Mr. B. D. Moreton, N.A.A.S. provincial entomologist ; and honorary members and their wives. Owing to Service duties Mr. Angus Watson, M.G.A. Secretary, could not be present.

The keynote of this meeting was informality and was set by Mr. Basil Harding's request, as the guests arrived, that they did not hesitate to follow their inclinations ; the farm was entirely at their disposal for the afternoon.

The Harding Brothers' Tenterden Farm

Most of this well-designed plant is constructed of surplus war material, but there is nothing to suggest makeshifts in the appearance of the cropping houses and enclosed composting shed, all of which is surrounded by a large expanse of clean concrete. Messrs. Basil and Noel Harding prefer shelves, but have a number of houses put down to trays—7,500 sq. ft. out of the total of 20,000. The tray system is combined with the shelf-cropping schedule and not run as a separate unit

Cultivation follows conventional but modern lines. Some experiments in progress designed to combat the incidence of small mushrooms in trays were discussed. A tray crop was shown which had been spawned and cased in one operation and had produced pin-heads in 17 days. Also shown were some trial shelf-beds planted with a Continental strain of spawn, the machinery introduced for composting, soil-breaking and sterilizing, and the handling of trays.

After an excellent tea at the Spinning Wheel, Tenterden, there was an informal discussion on factors governing the size of mushrooms. Possible steps which might be taken to overcome the proneness to small mushrooms in tray culture were suggested by Mr. Atkins in reply to questions by Mr. G. V. Allen and Mr. E. A. Gook. The watering of trays was contrasted with the technique for shelves.

Col. Turner asked whether the M.G.A. had considered the point he raised at their first meeting regarding the supply to members of advertising matter. Mr. Simons gave a full reply in a statement on the present stage of Mushroom publicity, the early prospect of a recipe leaflet to be slipped into chip baskets, and the publication of a book of recipes on 3rd May. Mr. Atkins reminded the members that 3rd May was the Research Station's Open Day and urged their full attendance.

Mr. Basil Harding concluded the meeting with a vote of thanks to the guests.

The local arrangements had been made by the Area Committee, composed of Messrs. W. A. B. Harding, G. V. Allen and G. W. Baker. Mr. Baker was unavoidably absent.

MY WAY OF GROWING

5 — Blandford Mushroom Farm, Dorset

by

McGregor Bulloch

(*Manager for Brig. A. S. G. Douglas*)

The farm which I am fortunate enough to manage is a well-designed and simple one to run. Simple, that is, to direct the operations which should lead to a steady and remunerative crop. In fact, it is a constant struggle against the time-honoured pests and diseases with every experimental change of method followed by different batches of disease. No grower is satisfied with his crop and I am no exception; add to this the spur provided by a keen and uncannily-observant employer, and the ingredients are at hand for a lively struggle.

I don't think that a plain recital of the various phases of growing from first to last would be of much interest to the reader, since there are already sufficient standard works on the subject, but I shall endeavour to picture the layout and some of the methods we use which may be somewhat different from the ordinary.

The farm is one of 25,000 sq. ft., with 12 huts, each of 2,000 sq. ft., averaged in two rows of six huts opposite one another with a broad concrete road down the middle. The roads around the huts and composting shed, etc. are also of concrete, so that it is easy to keep the place clean and to work in comfort during bad weather.

The huts themselves have concrete floors, asbestos inner walls, and are insulated with 4″ of slag wool. The 8 beds in each house are arranged in two tiers of 4 beds with a 3′ 6″ central gangway and ample room at the sides, and are of reinforced concrete supported on tubular steel uprights. Since galvanized iron side sheets are used instead of side boards, it will be seen that there are no timber replacement problems, while disinfection is easier to carry out. **It may be of interest to point out that no trouble is experienced whatsoever in using concrete beds.**

Brig. Douglas's Blandford Farm

Before discussing the growing details, I would emphasize very strongly the need for keeping records of every possible event which takes place, from the moment the manure supply arrives to the time when the spent compost is removed. Some of these records may be of no use, but often a very plain picture may be obtained of the effect of a certain growing condition on the crop by making up a graph or diagram from these records.

These are some of the records kept. Firstly, the obvious ones, such as the dates of all operations which, of course, are noted by even the most unmethodical grower. The most important records—because they are the most revealing—are the weights of mushrooms which are picked from individual beds in each house. From these weights, all the factors which have any bearing on the cropping period can be extracted and examined at leisure. Temperatures are recorded every day; maximum and minimum temperatures in each house as well as outside. Occasionally bed temperatures are recorded over the life of a house when any particular condition is being studied, such as the effect of alterations to ventilators, or low voltage heating in bottom beds. During peak-heating, distance recording thermometers are used for a general check, but every bed reading is taken on occasion, sometimes at two-hourly intervals in order that a complete picture of the peak-heating process may be plotted on a graph and studied. Finally, although they may never be used, complete records of atmospheric pressure, humidity, etc., are taken in case they may provide the missing link some day.

And now to the growing, with a brief outline of our methods in each operation.

Composting is treated as a necessary parboiling of the food of the mushroom, and I am fairly open minded on this problem. There are orthodox methods, which in themselves are extraordinarily elastic, but I have a feeling that the longer a compost is fermented over a certain point the less likely it is to produce the gigantic yields we all

pray for. On the other hand, there is a real danger in under-composting, unless careful control of peak heating is maintained, so that my main problem is to find the happy medium.

To cut down the labour involved in stacking, the manure lorry is unloaded as it arrives, the bottom of the stack being built to shape, and each succeeding load being added till the stack is finished. The stack remains unturned for a further 7 to 10 days, when it receives its first turn. Three turns are given at slightly decreasing intervals, and three or four days after the final turn it is filled into the house. With this method, the bottom layer is up to three weeks old by the first turn, but by regulating the water added to each layer as it is stacked, the base of the stack is in no way unpleasantly conditioned at the time of the first turn. Water has to be added at the first turn, and a fairly high moisture content is aimed at in the final product. The result is a fairly dark uniform compost, slightly undercomposted, with a great heat reserve, which enables it to peak-heat easily, rather too much so at times. This led to severe attacks of *Chaetomium sp.* recently, when the top beds rose to a higher temperature than that indicated by the remote reading thermometer.

Apart from the help given during peak-heating by a slight under-composting, the method appeals because of the occasional noticeably larger yields obtained in individual beds, as our records show. Hoping for the time when we can control conditions for each bed, I am persevering with a style of composting which, theoretically, should raise the farm's output.

Filling the houses is greatly speeded up by the use of a petrol-engined Wrigley tug which tows loaded trolleys from the composting shed through the central gangway of the house on a non-stop circular route, and 2,000 square feet of 9″ beds are filled in approximately half a day. Four men empty the trolleys, two pat down the beds and four men load the trolleys, the compost being passed through the DLP composting machine as with normal turning.

During the peak-heat, two 5 kw. heater fans and four small extractor-type fans are used to mix the air, and fairly close control of bed temperatures is obtained, there being no difference sometimes between top and bottom beds. The growing cycle is very tightly controlled to give 3 crops per annum from each house and consequently each operation is cut down to the bare minimum in order that an average of ten weeks cropping may be obtained. Records came in useful when the question of the interval between spawning and casing was looked into. Intervals of from 8 to 21 days were tried and on the counts of heaviest yields and earliest appearance of crops, **a period of about 14 days was judged to be right.**

With regard to spawning, I am of the opinion that this is the least mysterious of all the mushroom rites. Given a good compost, and having regard to the orthodox temperature and moisture limits, modern pure-culture spawn from reputable spawn makers will grow however it is placed in the beds. Many variations have been tried with no apparent difference. A minute sprinkling of crumbled spawn on the surface of the bed was cased immediately on one occasion, the rate

of spawning being about one carton to two or three hundred square feet and no vast difference was apparent to the eye, although weights were not recorded. This was merely a test, of course, to determine the viability of the spawn under the worst conditions.

Our casing soil is obtained from our own land, and is a clay loam with a fairly satisfactory performance. Being a top soil, it is sterilized by steam in a shallow pit, the steam being provided by an ancient but highly esteemed 10-ton road roller.

Watering does not prevent any great difficulty during the cropping period, partly because our soil holds water fairly well and partly because of the vigorous spawn run which would not easily be retarded under slightly over moist conditions. I am, with many others, a great believer in plenty of ventilation, and normally keep all ventilators open as much as possible except during the coldest weather.

During the summer, doors are open at both ends all night, and the wide temperature fluctuations seem to have no adverse effect on the crops. In fact our summer crop is nearly fifty per cent. greater than in winter up to the moment, but ventilation problems are being studied more carefully, since it would seem that herein must lie the main reason for this unusual reversal of normal conditions.

Insect pests are few and far between, save for mild attacks by fly larvae which are easily controlled by BHC and DDT. Springtails and mites are practically never seen.

Most farms have a pet disease against which constant precautions must be taken and, at Blandford, verdigris is the most feared. **Efficient peak heating has practically eradicated it,** but sporadic outbreaks occur and these can be traced to out-of-balance bed temperatures during peak-heating. A mild warning to fellow-sufferers. When pushing up the peak heat, watch the bed temperatures very carefully since an equally disastrous compost invader, *Chaetmium olivaceum*, may develop, especially in an underdone compost.

Returning to the subject of 3 cycles per annum per house, the change from $2\frac{1}{2}$ cycles was mainly carried out because of the appearance of disease in the last stages of the crop but, no doubt, if and when the perfect compost and growing conditions are achieved we shall revert to the twelve-week cropping period since there is a tendency for the last flush to be nipped in the button, so to speak. Experience has proved that, with a good compost, a flush of up to $\frac{1}{4}$ lb. per square foot can be achieved around the 11th week of cropping, and comparative charts indicate that 12 weeks would be, economically, a better cropping period.

In conclusion, would any member care to forward an authoritative work on ' The Treatment of Grey Hairs ' in exchange for a sealed envelope containing instructions on how to grow 5 lb. to the square foot ?

We hope to publish in the October Bulletin an important contribution on *Ventilation and the Growth of Mushrooms* -a joint paper by Dr. I. F. Storey and Dr. R. L. Edwards.

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by

R. L. O. JACKSON
B.Sc., B.Sc.(Hort.), A.R.C.S.

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SOME ASPECTS of the TRAY SYSTEM

2—*Pests, Diseases and Casing Soil*

by

Captain Giles Tweedie

It is not my concern to go into details of any particular pest or disease in this brief "aspect," but we who grow on trays have a special problem to insure no carry-over. Moulds various and profuse grow strongly on woodwork in the steamy conditions of a Heat Room, and as I hear they number upwards of 5,000 we should obviously use every means to eradicate them.

In so far as pests are concerned, we need have no fear of these now. Admittedly Cecid larvae and eelworms are still unconquered, but our old enemies—flies, springtails and mites—can largely be written off with BHC and/or HETP, which are now household words on every up-to-date mushroom grower's lips. Surely they must be **regularly** and **carefully** applied.

We must gradually lay a bit more concrete. It helps so much in the fight against the old bogey of Site Contamination. Not even in the Tray System can we avert this danger completely, and all that can be done must be done to improve the general cleanliness and appearance of the plant.

Can we on the Tray System do anything once disease is established in a crop. Yes, we can. Indeed, we **must** throw out those trays which have been attacked, before they can contaminate the plant any further.

We are unable to observe what is taking place when the trays are in the Heat Room. In limited air capacity and the high humidity of the heat room it will be possible to achieve a good kill of flies, mites and springtails with Agrocide smokes at peak heat and again immediately after spawning. The maximum effect is achieved in conditions of high humidity induced by live steam.

Immediately prior to casing I also advocate applying a fine film of Agrocide 3 dust through a blower to the surface of the compost. This is easy for growers who stack their trays in the growing room before casing them.

During cropping I alternate dust with smoke. In every case the strength and mode of application are of vital importance.

Most of us have suffered, and many are still suffering, from small mushrooms on trays. I do not pretend to know the answers, but I feel sure the whole system lends itself to the production of small mushrooms. They like them that way in America, where the Tray System originated. To counteract this tendency to smallness, positive action must be taken. A casing soil which consistently produces large, heavy mushrooms must be sought. No effort must be

spared to find such a soil, which will be one which allows plenty of aeration of the compost beneath. There is little enough ventilation in a tray house anyway—and the compost must be helped to breathe all it can.

Measured containers will greatly assist the application of soil to the trays. Each individual grower can best decide on the most convenient arrangements. Some hold that a thin layer of soil produces larger mushrooms than a thick layer. I don't know. Advice is so often confusing. I am told, for instance, that the casing of shelves should be delayed for some weeks after spawning. Yet I would rather case at 10 to 14 days than at 24 to 28 days for larger (but probably fewer) mushrooms. This may be rubbish—but my motto is Sooner rather than Later!

Then follows what I always think of as The Uncertain Fortnight. When should we start watering? Our ignorance of the environment required is probably due to the fact that every grower realises his own problem here is very different from that of any of his friends.

Personally, I have had quite a lot of bother with stroma—not the usual type of stroma but a fern-like growth of the mycelium which makes the surface of the casing soil quite white. And there are myriads of fruiting bodies, many of the pinheads being fused. It is comparatively easy to correct the conditions in a shelf house, but the ventilation of trays is more difficult.

In all probability I am too much of a novice to strike the precise moment to start watering in. Perhaps none of us could give the right answer in all conditions. I hope not; it is rather akin to one's first salmon, or one's first solo flight.

IT IS PSALLIOTA BISPORA!

Continued from page 180

former *Monilia Fimicola* and asked in turn that the Society abandoned its suggested name of "White Mould" for *Mycogone perniciosa,* since no grower would dream of using a term so associated with Plaster Moulds.

Other speakers during the day were Dr. R. L. Edwards, who outlined current methods of growing mushrooms and the preparation of mushroom composts; Dr. I. F. Storey, who discussed the effect of environmental conditions on the production of mushrooms—a study which growers are quickly realising is of real significance to the design of houses; Mr. H. H. Glasscock, who gave an illustrated résumé of the principal diseases and competitors; and Miss Catherine Duncan, who described her experimental approach to the problem of Truffle.

The President of the Society, Dr. P. H. Gregory, presided, supported by the Secretary, Dr. C. J. Hickman.

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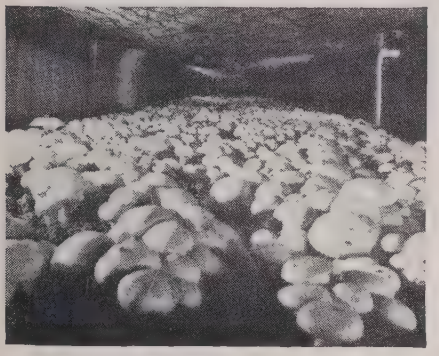

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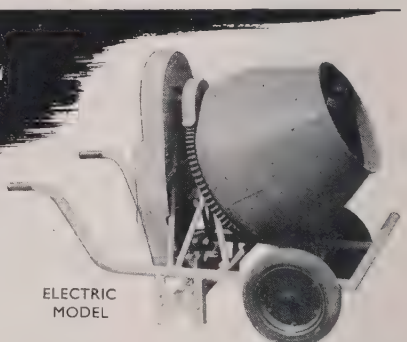

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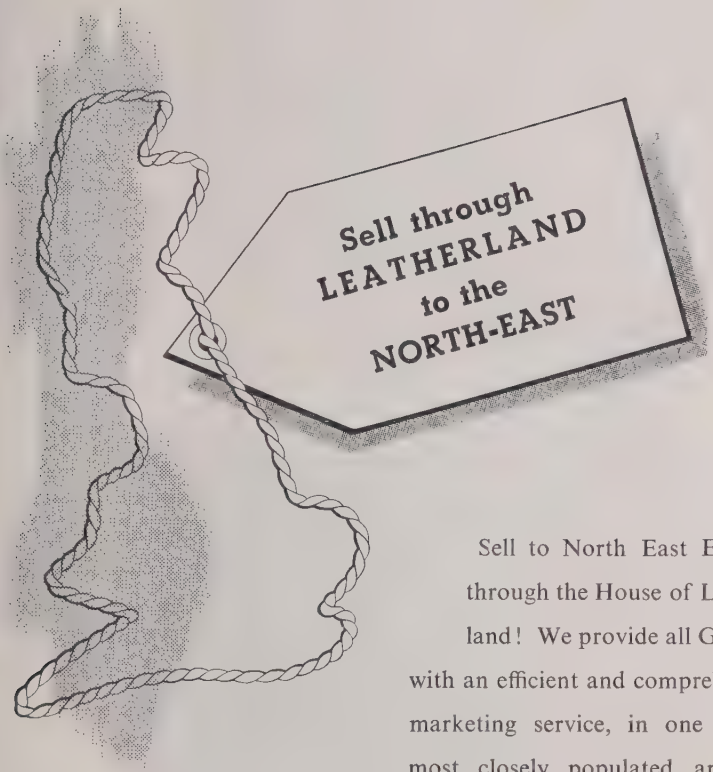

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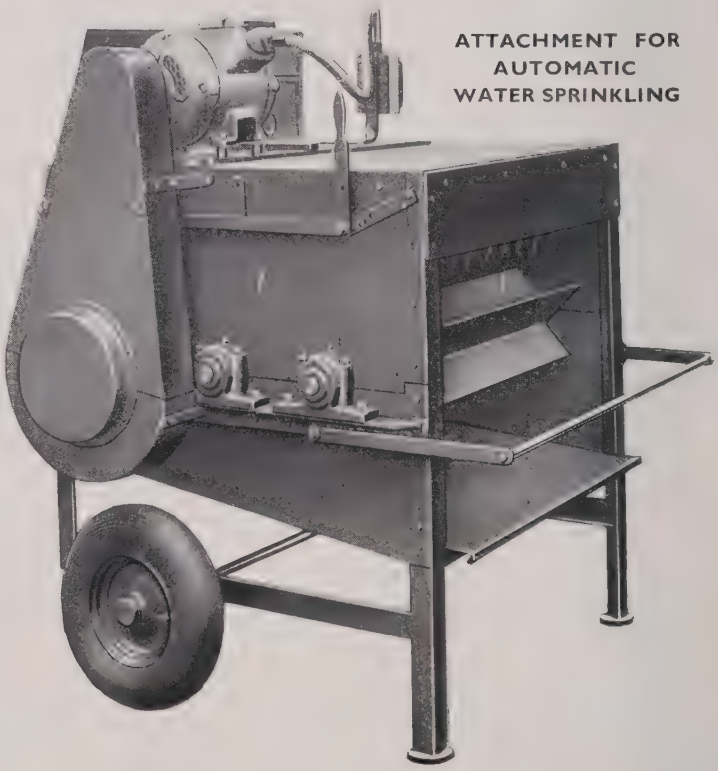

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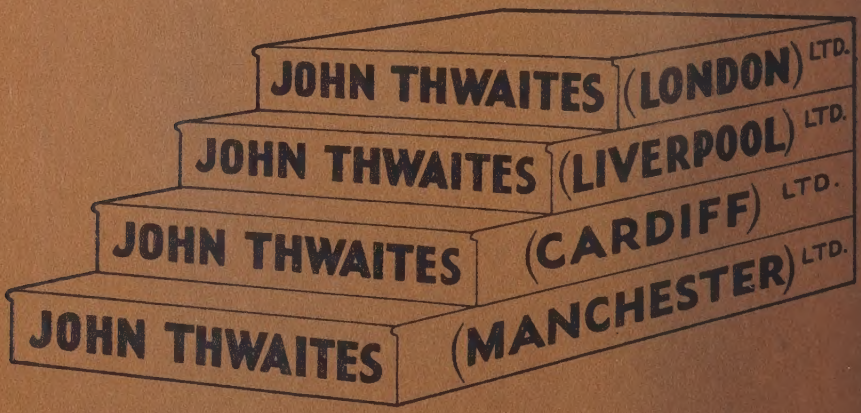

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